

Merkel (G. H.)

# OZONE:

ITS MERITS

AS A DISINFECTANT, ANTISEPTIC,  
AND ANTI-ZYMOTIC.

BY

G. HERMANN MERKEL, M.D., M.C.A.,  
BOSTON, MASS.





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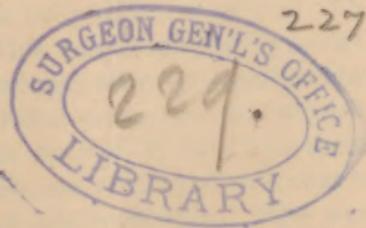
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## OZONE.

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OZONE has engaged the attention of the most expert among the savants of Europe for almost half a century. The discovery of oxygen by Joseph Priestley in 1774 had given a soul to chemical science, before that a mere grouping of empirical observations; and the fresh impulse set investigation into active motion all over the Continent. The "vital air" which Dr. Priestley had exhibited was made the subject of numerous experiments in the various countries. It was impossible, therefore, that the existence of ozone should not be foremost among the demonstrations of the new chemistry. In 1785 Van Marum of Holland passed an electric current through oxygen gas, and perceived that it acquired thereby a peculiar odor and the power of oxidizing mercury. Cavallo discovered that this electrified oxygen—or "electric aura," as he styled it—had a purifying effect on animal and vegetable matter, and used it as a disinfecting application to fetid ulcers. Dr. John Davy, in 1826, formally recognized it as a principle in the atmosphere, and thus gave it a place within the scientific household.

Schönbein of Basle, however, professor of chemistry at the university, gave to ozone its "local habitation and a name" in 1840. He first imagined that it was a body which combined with hydrogen to constitute nitrogen. This was disproved by other experimenters, who showed that the peculiar odor was produced by the decomposition of water alone, and that ozone was but oxygen in an allotropic form. Berzelius was decided in this judgment. Schönbein was unwilling to believe this, and contended, first that it was a hydrogen hyperoxide,  $\text{HO}_2$ , and afterward  $\text{HO}_3$ . This was subsequently shown to be incorrect; and finally Andrews, in 1856, demonstrated that ozone, however found, is identical in its nature, entirely distinct from hydrogen; and likewise that oxygen is con-

verted into it by means of the electric spark, and undergoes thereby condensation, and reduction of volume.

Dr. Odling propounded the explanation that ozone was formed by the molecule of oxygen,  $O_2$ , united with an additional atom,  $O_2 + O$ , or  $O_3$ . Its formation, he believed, simply means the condensing of oxygen into two-thirds of its former volume. The oxidizing power which ozone possesses is thus explained by the well-known fact in chemistry, that molecules part with facility with their super-abundant constituents. Housewives using cream-of-tartar to raise their dough are profiting from this idea. The heating of ozonized oxygen will cause the oxygen to resume its original molecular dimensions, and part with the additional atoms ; which will then, in their turn, being in the nascent condition, form new unions readily with whatever substance may be contiguous. In our present state of knowledge, therefore, ozone is defined as simply a condensed or allotropic form of oxygen, and each is convertible into the other.

#### **OZONE ANCIENTLY MISTAKEN FOR SULPHUR.**

Many of the former conjectures in regard to this substance are very amusing. Travellers have noticed the peculiar odor during periods of electric disturbance of the atmosphere, and the ancients regarded it as actually sulphurous. Homer repeatedly mentions objects which had been struck by lightning, from which, he declares, "the smell of smoking sulphur rises." The thunderbolt was regarded as constituted of fire and brimstone, and was represented as the weapon of the gods. In the "Iliad" a bolt is represented "with the flame of burning sulphur" striking a ship. The destruction of Sodom, and other cities on the site of the Dead Sea, was doubtless thus occasioned ; the naphtha deposit thus set on fire affording a receptacle for the waters of the River Jordan which had before flowed over and to the Gulf of Akabah. The prophet Isaiah also speaks of the *tophet*, or crematory, prepared for the King of Assyria, and adds, "The breath of the Lord, like a stream of brimstone, doth kindle it." In strict accordance with this sentiment, sulphur bore the name of *theion* in Greek,—the divine substance.

Phosphorus, however, and even chlorine, has been included in the conjecture of being a celestial or atmospheric product. It may add somewhat of plausibility, that these elements were often employed by experimenters in the generating of ozone.

It has also been conjectured that ozone rendered atmospheric air unwholesome, and predisposed to epidemics of cholera, yellow-fever, etc. The later evidence has proved the exact reverse,—that it destroys the causes of contagious and zymotic disease.

#### OZONE IN THE ATMOSPHERE.

The presence of ozone in the atmospheric air was at first disputed and denied. Professor Andrews of Belfast made several experiments in 1867 which seem to have been conclusive. M. Houzeau had declared that ozone and hydrogen peroxide only could decompose the neutral potassium iodide; but Andrews demonstrated that the body in the atmosphere that did this is identical with ozone. Dr. C. B. Fox, of the Royal College of Physicians, London, repeated the various experiments of his predecessors, and declares the matter placed beyond a doubt. Observation shows that ozone is more abundant at a distance than near the earth's surface. Seaside places are visited by a greater quantity when the winds blow from the sea than when they proceed from the land; the sea being a great manufactory of allotropic oxygen. There is usually a greater development in February and May than in other months; autumn having the least. A large fall of rain is characterized by the increase, and the amount has been thought to be greater when we have a new or full moon than during the first and third quarters. In eclipses the amount is often very large; but in earthquakes the reverse is the case. In short, ozone is contained in the air in larger quantity in winter and spring than during the summer and autumnal months. The frequent storms and maximum of electricity, with low temperature and activity of vegetation in spring, are doubtless the occasion of this larger amount; while the higher temperature, the decomposition of animal and vegetable matter, and the minimum of electricity in the lower strata of the atmosphere, are causes of its diminution at other periods of the year.

"Ozone is found in greater abundance," says Dr. Fox, "in pure country air than in impure town air, on mountains than in valleys, at the seaside than inland, in well drained and ventilated towns than in those where these important sanitary matters are neglected." It is the great deodorizing and purifying principle of nature, and therefore is consumed in the oxidation of the noxious exhalations.

tions where human beings are closely aggregated together. Dr. Shapter could find little in the city of Exeter, in England, and Dr. Angus Smith could find none in the air of Manchester. Dr. C. Evans observed that the north-east wind which reached Hackney from the country was highly charged with ozone, but on arriving at Fulham, after having crossed London, had lost nearly all traces of this substance. On the other hand, the south-west wind arriving at Fulham was rich with it, but on reaching Hackney, after passing London, was almost destitute of it. Lyons, in France, has been named "the town without ozone." At Geneva and Chamouni the quantity is very large. Dr. Wetherill ascertained that the air of the public grounds at Washington yielded an abundance of ozone at night; while that of the streets of the city at the same time indicated an absence of this gas. At seaside stations there is an enormous amount.

The municipal body of Paris organized a series of daily observations in 1866 and 1867, in the various *arrondissements* of that city, with most significant results. I extract the following as most instructive:—

At Passy, near resinous trees, the mean was 6.39; at La Villette, close to a quay on the Seine, 0.96; at Menilmontant, near a tallow manufactory, 1.16; at Fountaine-Molière, almost directly over a public urinal, 0.38; at the École de Médecine, close to a hospital, 0.80; at Rue Racine, near a reservoir, 1.69; at the Reservoir de Vaugirard, 8.37; at La Chapelle, close to artesian wells, 3.08, and at Butte-aux-Cailles, also near such wells, 4.79.

Professor Heaton and others declare that ozone is always absent from the air of an inhabited room, even though the window is open. This, however, is disputed. It has also been declared, by the best Continental authorities, to be almost entirely absent from the air of hospitals, especially of those devoted to fever patients. Means for its artificial generation have been accordingly suggested.

The preponderance of ozone in sea-winds has been noted in various parts of the world. Admiral Fitzroy lays down the rule, in the "Weather-Book," that the winds which accompany the greatest indications of ozone are those which blow from the nearest and largest sea. Tests were said to read about one-third higher when sea-winds blow than during the prevalence of land-winds.

M. Morin explains, that the pulverizing of water—as into the

form of spray—is always accompanied by the development of ozone. This change in the condition of the air, it will be remembered, is largely produced by passing the electric current through it. That electricity is developed in sensible quantities in the neighborhood of waterfalls, and in large amount on the seashore, particularly when the waves dash themselves violently against the rocks, creating much spray, is well known.

Sea-water also holds in solution about one-thirtieth of its volume of air. It has been shown that this air contains thirty-two per cent of oxygen, whereas the air over land has only twenty-one per cent.

Plants evolve ozone from their leaves and green parts, and set more free during the daytime than can be found in the air about them. The same thing is also true during the night, when they grow thickly and vigorously, but not in the case of isolated vegetation. Plants growing in the country give off more ozone during the day than town plants. In the midst of towns and a dense population, night air exhibits a larger proportion than day air; but as the animal population diminishes, and the vegetable kingdom predominates, the daily supply is increased till it exceeds that of the night. The interiors of the corollas of plants do not produce it.

Dr. Danberry, following up these experiments, concluded that atmospheric ozone was due almost entirely to plants; being generated by the green parts during the day while emitting oxygen, the flowers producing none.

#### **PERFUME OF PLANTS A GENERATOR OF OZONE.**

The disciples of the philosopher Empedocles planted aromatic and balsamic herbs as prophylactics against pestilence. The researches of modern observers appear to justify their notion. Lawes, Gilbert, and Pugh have attributed the production of ozone in vegetation rather to the intense effect of the atmospheric oxygen upon the minute quantities of volatile hydrocarbons evolved by the plants, than to any action within the cells. Montegazza states that odoriferous flowers discharge a large quantity, but flowers without perfume are destitute of it. Cherry-laurel, clover, lavender, mint, lemon, fennel, develop it largely in the sunshine: so do the flowers of heliotrope, narcissus, hyacinth, and mignonette, as well as the essential oils, such as nutmeg, anise-seed, thyme, peppermint, etc.

Ancient physicians regarded the odor of laurel as a disinfectant. They seem to have been correct. The sunflower is also said to exhale ozone in large quantities; and Dr. J. Murray even attributed this virtue to the aroma of powdered tobacco.

#### OZONE FROM ATMOSPHERIC ELECTRICITY.

Faraday has shown that the friction of water-drops against all bodies develops in them a most powerful charge of negative electricity. Doubtless the contact with the air has the like influence. Volta found it to be produced by allowing the fine spray of a fountain to fall on the plate of a straw electroscope. Humboldt observed that the spray of a waterfall or a lofty cascade filled the air of the neighborhood with negative electricity, which can be detected at three or four hundred feet distant. As electric discharges are incessantly taking place, the production of ozone is therefore constantly maintained.

Saint Pierre ascertained that ozone was developed by the mechanical action of blowing-machines, and ventilators producing strong currents. This fact, he suggests, may account for the healthy action of winds. Perhaps the attrition of the particles of air against each other has the same effect. Storms, tempests, hurricanes, and water-sprouts are all active in this way, and so beneficial.

#### OZONE IN EPIDEMIC.

Different opinions have been given in regard to the influence of atmospheric ozone upon the public health. Dr. Tripe declared, that, during the seven weeks of the last quarter of the year 1857, no ozone was present at Hackney, and that, notwithstanding, there was no disease prevalent during that period, and the mortality was below the average; while London had five per cent in excess at the same time. Other writers have also conjectured that cholera years were characterized by an excess.

More extensive observations, however, seem to have utterly dispelled these opinions. The members of the Scottish Meteorological Society carried out a series of observations in one of the suburbs of Edinburgh, and perceived, that, when the largest quantities of ozone were obtained, "the air had a pleasant sharpness to the feelings, exercising, as it were, a stimulating influence on the spirits. When, on the other hand, the air was close, and seemed to

exert a slightly depressing effect, little if any ozone was detected." Schönbein declared his belief that a deficiency of ozone, or an excessive production of miasmatic matters, in the atmosphere, favors the propagation of epidemic diseases; mentioning, in corroboration, that ozone is most abundant in winter, when zymotic diseases are least plentiful. It would be necessary, however, to show whether it affects the poisons which generate them. We know that it will destroy noxious odors; but can putrescent emanations produce a disease? The earlier comparisons between the prevalence of cholera and the presence of ozone in the atmosphere appear to have exhibited contradictory results. The outbreak generally took place when the quantity of ozone approximated a minimum; but its increase did not seem to have a decided influence in the way of arresting the progress of the visitation. In catarrhal and pulmonary disorder, atmospheric ozone appears to be of little benefit in advanced stages, but highly beneficial at first. Catarrh and influenza are seldom experienced in an atmosphere highly ozonized. Tubercle will be removed by the constant contact of air in this condition. Rheumatism is also radically cured.

#### MALARIA.

The Rev. Henry Ward Beecher declares that malaria is like a heavy wet blanket thrown over the medical profession. It is certainly a convenient term to use when something must be said to show people that the physician knows something; and the rationality of it is not in question. True, nevertheless, that no malarious air has ever disclosed other elements than the common atmosphere. The chilly evenings succeeding to sultry, debilitating days, check the insensible perspiration, leaving the body loaded with its own poison, which is worse than any thing often found in the external air. The Roman Campagna can be safely visited by anybody properly dressed.

Yet account should be taken of the fact that in damp atmospheres, and where there is decay going on, the oxygen of the air is steadily undergoing an electric charge, and parting with its superabundant particles, which had constituted it ozone. This indicates that there may be really a malarial condition of the atmosphere, and that it is coincident with a deficiency of electrified oxygen. The observations of Clemens, Schönbein, Berigny,

Hammond, Billard, and T. Boeckel, tend to show that the quantity of ozone in the atmosphere, and the prevalence of diseases termed malarious, bear an immense proportion; likewise that this is the case not only in point of time, but also in respect to locality. Dr. Boeckel, indeed, has observed that the malarial fevers only reign when the ozonometer indicates zero. Dr. S. Gaillard has also noticed a similar relationship between the presence of ozone in the air and the appearance of intermittent and bilious remittent fevers. M. Wolf of Berne observed that a rapid diminution in the quantity of ozone is followed by considerable increase in the mortality. During an epidemic of dysentery which prevailed there in August and September, 1855, the energy of the disease appeared to augment or diminish with the quantity of ozone.

Dr. Ross, medical officer of health for St. Giles's, London, found, that, during an outbreak of relapsing fever, the amount decreased in the atmosphere as the mortality from the disease was greater. And at Salford it was remarked in 1869, that, "as the amount of ozone decreased, the seizures in measles, scarlatina, typhus and continued fever, increased."

In short, a deficiency of ozone in the air predisposes to disease, particularly of the epidemic form, by reason of the depressing and debilitating effects of such air, in consequence of its feeble powers for oxidizing animal *débris*. A permanent diminution in the normal amount probably favors the development of chronic diseases characterized by mal-nutrition, imperfect oxidation, and degeneration of tissues.

Dr. Fox describes it as "vital air" *plus* force, that decomposes some of the offensive and deleterious products of putrefaction, and has important functions to perform in nature. In his work on the subject he presents a summary of its uses in the arts and industries, adding the remark, that the salubrity of a town or city may be pretty accurately estimated by the effects of its air upon ozonoscopes. "Ozone," he goes on to say, "is a deodorizing and purifying agent of the highest order, resolving and decomposing into primitive and innocuous forms. It should be pumped into our mines and cities, and be diffused through fever-wards, sick-rooms, the crowded localities of the poor, or wherever the active power of the air is reduced, and poisons are generated. Its employment is especially demanded in our hospitals, situated, as they

mostly are, in densely populated districts, where the atmosphere is nearly always polluted by re-breathed air, decomposing substances and their products, and where no mere ventilation can be fully effective. If practicable, it would be highly advantageous to direct streams of sea-air, or air artificially ozonized, into the fever and cholera nests of our towns."

#### OZONE AS A REMEDIAL AGENT.

The European Continental *savants* have been active in their explorations to ascertain whether ozone can be employed to advantage as a curative agent. Its solubility in water was naturally considered as essential for this purpose. Schönbein demonstrated accordingly, by actual experiment, that this could be effected. Water was so thoroughly impregnated with ozone as to dispose entirely of noxious decomposing matters, thus restoring it to a normal condition. Other chemists concurred with him. Professor A. W. Hoffman of Berlin, and Professor Carius of Marburg, the most accomplished experts in such matters in all Germany, were employed to review the matter. Their report established the conclusion undeniably, that ozone is absorbed by water.

In December, 1872, the Medical Society of Berlin memorialized the Imperial Commissioners for Religious and Medical Affairs of North Germany, in regard to the matter. It was done, and the ozone water was tested in every way that could be imagined. Crucial tests were made, both chemically and clinically, in the feverwards of hospitals and in malarious and infected districts. The results were successful and convincing. Ozone water was found effective as a preventive and curative agent in contagious diseases of all kinds, and especially in malignant diphtheria, typhus, and acute rheumatism, and to be a specific for chronic affections of the heart and their sequelæ.

The Faculté de Médecine of France has since recognized these facts, and assigned ozone water a place in their *Pharmacopœia*, not only for those diseases, but also for bronchial affections, croup, whooping-cough, etc.

The following extract from an editorial article in "The Boston Journal" of Aug. 8, 1883, is a succinct statement of the matter: and, though by a secular writer, I will copy it as expressive of what we have to say:—

"It is impregnated with ozone, or condensed oxygen. This preparation is useful, according to the amount of ozone it contains, for table-use and as a common beverage, being of an excellent dietetic quality; as a tonic in convalescence, after long and exhausting illness, eradicating traces of the disease from which the patient has suffered; and, in its most concentrated form, as a medicine, when it should be employed under the advice and direction of a physician. As a medicine, its action is immediate and intense, and in many cases its use will obviate the necessity for other medicines. Its action as a medicine is to clear the system of impurities; and the class of diseases which it reaches is therefore a very large one, including all which result from any contamination of the blood. In Continental Europe it has already been successfully introduced, and adopted in regular practice; and several eminent physicians abroad have expressed the opinion that ozone is to be an important factor in the medical practice of the future."

It is now claimed that such disorders as Bright's disease, diabetes, rheumatism, intermittent and other fevers usually ascribed to a malarial origin, nervous prostration in its various forms, impetigo and other skin-diseases, chlorosis, and the various female complaints, and other disorders resulting from impurity of the blood, imperfect digestion and assimilation, defective and faulty innervation, are successfully treated with ozone water prescribed by a competent and judicious physician.

German physicians eminent in the profession in their own country have increased the list of maladies thus curable. Corup-Bessner asserts, that in diabetes, gout, jaundice, and kindred ailments, ozone water is not only infallible, but indispensable. Dr. Lenders, district physician in Berlin, employed it successfully for intermittent and remittent fevers, typhoid, typhus, tuberculosis, bronchial catarrh, anaemia, chlorosis, septicæmia, pyæmia, puerperal fever, chronic affections of the heart, and other diseases occasioned by imperfect oxygenation of the blood. He cites several cases of gangrene occurring after surgical operations. A course of the ozone treatment had a most extraordinary effect on the spinal chord and nervous system generally. One case of locomotor ataxia, or tabes dorsalis, in which strychnia and argentum nitricum had proved

utterly ineffectual, was successfully treated with ozone water. The patient recovered rapidly.

The French Medical Faculty, and in particular Drs. Langier and Fougeras, have employed ozone and oxygenated preparations as an antiseptic in gangrenous wounds and specific ulcers, with successful results that seemed almost miraculous. Brillot, another eminent writer, testifies especially to the facts educed by his own experience, that ozone water is an efficient antipyretic, and that it will effectually preserve animal and vegetable matter from decay.

Dr. Golden, of St. Thomas Hospital, London, declares in an official report, that, in a case under his charge, a putrescent syphilitic ulcer of long standing, on the back of the palate, was entirely cured by ozone applied externally, and administered internally.

Dr. Fieber, professor and tutor in ordinary at the Imperial Hospital in Vienna, and director of the department for nervous, laryngeal, and thoracic diseases at the Mariahilf Ambulatorium, recommends ozone water, in the most unequivocal terms, as an unfailing remedy in neuralgia, nervous and exhaustive diseases, dyspepsia, sleeplessness, diabetes, and obesity.

Professor Preyer of Jena administered prussic acid to a large number of animals, and purposely deferred the use of ozone till the apparent symptoms of dying were present. Immediately upon the application of the remedy, they recovered completely from the toxic influence. When administered by inhalation, it is a remedy for asphyxia and strangulation by drowning, coal or sewer gas, etc., and also in the syncope occasioned by the action of chloroform and ether.

#### DISEASES OF THE BRAIN AND SPINAL CORD.

The most conclusive evidence of the value of ozone water in disease of the brain and spinal cord is given by Dr. Wilhelm Waldmann, chief physician in Berlin, in his celebrated treatise on "Oxygen and Ozone" (p. 22). He had been afflicted for many years with an affection of the spinal cord and hemiplegia, the result of chronic spinal meningitis. He lost entirely the use of the lower extremities, and for two years was wheeled about in an invalid-chair. He was induced to give a fair and patient trial to ozone water, and thus states the result: "The first effect of the ozone in me, as in all the cases in my private practice in which I have since made

use of that remedy, was a peculiar sensation in the stomach, caused by its special influence on the *vagus* nerve. It was as though the entire abdominal viscera had been set in motion. My appetite rapidly increased, and I could take larger quantities of food without distressing the stomach or digestive organs. The sleeplessness disappeared, and I could now sleep soundly and uninterruptedly all night. My health was restored, and my spirits and mental faculties became again buoyant and vigorous. I had an intense desire to resume my correspondence and literary labor, and was able to walk a few steps at a time, at brief intervals. After persevering four weeks with this ozone treatment, the power of locomotion was so remarkably increased that I could walk a long distance with comfort and without fatigue."

Professor Waldmann also cites another example. A Mr. X., fifty years of age, had suffered from disease of the spinal cord, with the usual accompaniment of facial neuralgia, for more than twenty years. He had tried every known remedy, without relief. He was placed under the ozone treatment, employing inhalation and internal administration. He very shortly experienced results like those of Dr. Waldmann, the disappearance of all symptoms, and entire restoration to health. The professor reports likewise the case of a lady. Mrs. Y., aged twenty-nine, was suffering from anaemia, and very nervous. She also exhibited symptoms of chronic catarrh of the lungs, also inclining to tuberculosis, emaciation, cough, and headache. All these disappeared under the ozone treatment. Dr. Waldmann strongly recommends the treatment in all bodily ailments, whether acute or chronic, especially during the winter, when patients are obliged to keep their rooms, and are precluded from exercising in the open air. He asserts with great emphasis that the most aggravated nervous disorders can be subdued, and natural sleep secured.

#### CASES WITHIN MY OWN KNOWLEDGE.

I. R. H. D. of Boston began the use, under my direction, in February, 1883. He had been troubled with rheumatism all winter, in his arms and shoulders, could not put on his coat without help, and was often disabled from business. In one month he exhibited a marked improvement, and two months later he was well.

II. T. B., also of Boston, had suffered from rheumatism for ten years. In November, 1882, I began his treatment, and he recovered in six months.

III. W. M. B., a sufferer from rheumatism and blood-poisoning by inoculation, began the use of ozone water in February, and soon found his health improved, and his sufferings greatly diminished.

IV. Hon. William D. Park, late member of the Senate of Massachusetts, had intermittent and remittent fever. He had been an invalid for ten years or more, suffering from sleeplessness, emaciation, and almost total indigestion. I put him on the ozone treatment last fall, with most gratifying success. He has gained sixteen pounds in weight, and regards himself as well.

V. E. A. C., a sufferer with dyspepsia and great nervous prostration, was treated by me in March and April, with decided benefit.

VI. Mrs. P. had suffered fifteen years from dyspepsia, and depression of spirits. For two months her diet had been only gruel, when I was consulted. I treated her with ozone water; and she has recovered her appetite and cheerfulness, and with fair prospect of a thorough cure.

VII. Mrs. M. had been for many years a sufferer from ovarian cysts. On the 30th of March, 1883, she was attacked with convulsions, which resulted in the rupturing of one of these abscesses, and the discharge of its contents into the tissue. Septicæmia, or blood-poisoning, was the result. Bright's disease now appeared. The right limb swelled to immense size: high fever ensued, with chills. Her hope for life appeared very frail indeed. About the 15th of April her physician began to administer ozone water. A week later the discharge of albumen was reduced one-half, and in two weeks it entirely ceased. Three months later she was in excellent health.

VIII. Mr. J. S. D. had marked symptoms of Bright's disease of the kidneys. In two weeks after beginning the use of ozone water, the discharge of albumen had almost entirely disappeared; and a month later he was discharged cured.

IX. Mr. J. H. D. had diabetes mellitus, and recovered in six weeks, from ozone treatment.

X. Mr. S. recovered of diabetes insipidus, from the same remedy.

XI. Mrs. A. B. was a sufferer from nervous prostration; also subject to floodings, and the stated recurrence of diphtheritic affection. She had been afflicted in this way for nine years. She was treated with ozone water, and, though still under treatment, exhibits improvement apparently permanent.

XII. Mr. S. B. N. had the misfortune to contract small-pox, from which his recovery was very imperfect. He was anaemic, wasted by marasmus, and greatly debilitated. He has been treated by ozone water with marked advantage.

#### MALARIA, QUININE POISONING, ETC.

XIII. Col. — — — became my patient in April, 1883. He had contracted intermittent fever in the army, in the summer of 1863, in the Yazoo district of Mississippi, where he was then on duty. The service was arduous, the severity of the heat compelling night-work, with its malarial exposure. The attack was very violent, and the chills very severe. He was treated with quinia in large quantities, without benefit. In August he came home on sick-leave, and was absent ninety days. His medical adviser now administered arsenic, with antidotes to counteract the previous drugging. On his way back to duty he was compelled to remain on the road, and receive professional care. Congestive chills were added to the other attack. More quinia and arsenic were given, and he became as regular in their use as at his meals. After the close of the war he returned North in a deplorable condition. He engaged in business, but continued to suffer. His weight, formerly one hundred and forty pounds, fell to one hundred and twenty-seven; the circulation was sluggish; the feet and hands, cold and moist; and sensation at the extremities was entirely suspended. The senses of hearing and sight were similarly impaired. The peculiar tintinnabulation and other symptoms of quininism were present and very conspicuous. He could neither read nor write, and lost the power to estimate distances. It was actually dangerous for him to go into the street. A greenish film came over his eyes, the beginning of a cataract. Indications of ataxia appeared, and a creeping paralysis invaded the physical functions. An apoplectic or epileptic seizure also took place.

In this critical condition he consulted a distinguished specialist in nervous diseases, and placed himself under his care. He was

now treated with strychnia, belladonna, and electricity. The physician gave him little encouragement. To the question how long might he expect to live, the answer was, about four months, if he took the best care of himself; but it would be no matter of surprise if he only held on three months. The wreck appeared to be almost complete. Under these prospects, the last winter was spent. There was faint hope for any ordinary attempt.

In April he came under my attention. Other medicines were given up, and only ozone water prescribed, in the concentrated form. He had a second fit not long afterward, which alarmed every one very much. It was not hopeful; but I had no confidence of benefit from any thing else. I could but persevere, be patient, and wait. Presently a change for the better appeared. He did not, however, persist in the ozone treatment, without interruption, till June: so that I did not have a fair chance. His engagements and discouraged feelings were in the way. But so much improvement was now evident, as to induce greater regularity. The appetite increased: the torpidity of function was mitigated; the numbness in the hands and feet disappeared entirely. There was also copious perspiration. By July he was able to walk without becoming tired, — a thing not before possible for many years. He gained thirty pounds, attaining a greater weight than before his sickness; became able to go up and down stairs with ease, and to walk in the street with a rapid gait. He does not as yet attempt to read or write; but he is cheerful, and very hopeful of good results. He had been considered as having but one chance in four to escape total blindness, and he has not lost that one.

All things considered, this may fairly be regarded as an advantage gained by ozone treatment.

The origin of disease is to be traced to impairment of the organic nervous system, which controls, and is in turn itself sustained from, the circulation of the blood. Any case which impairs the circulation, or covers the tone of that department of the physical organism, will be followed by functional disturbance; and eventually, if this is not corrected, organic lesion is certain to result. The great category of diseases is thus accounted for. The most prolific source is arrest of vital functions; and zymosis is perhaps the most influential factor in the case. Whether the poison is introduced from without, or is engendered within, the body, is of relative

importance only. The urgent matter is to arrest it, and render it innocuous. The various antiseptic, detergent, cathartic, and other remedies have this object in view; and their value depends entirely upon their efficiency to accomplish it.

The enthusiasm with which every "new remedy" is greeted, and the almost equal suddenness with which most "new preparations" are discarded, show conclusively that the medicines in use do not adequately meet the wants of physicians. We cannot return to the atrocious mercurial and other agents of another age and method. The immense fortunes made by certain venders of proprietary medicines protected by copyrighted label, and the great competition in that department of business, demonstrate with equal force that the people at large are conscious that medical skill, and the agents employed, fall more or less short of what the public have the right to expect. Impurity of the blood, and impairment of nervous energy, constitute the basis of the prevalent diseases; and the ordinary means have not, in their opinion, succeeded in remedying them.

Ozone, being a condensed and active form of oxygen, the great life-agent of nature, appears to be the needed auxiliary. It enables the proper medicines to do their part more effectually, and so aids the skilful physician in his zealous efforts. It neutralizes the various morbid and disintegrated elements in the body, stimulates the nervous system and the emunctories to remove them, thus itself operating as a medicament of rarest virtues. It also adds vigor to the body itself. Where oxygen exists in due proportions, there is health; and ozone, being a concentrated oxygen, is most potent in securing that condition.

The various disease-germs, bacilli, bacteria, microzymes, or whatever they may be, die in pure air, or fluids abundantly supplied with oxygen. They thrive and multiply only in decay in morbid conditions, or where the integrity of the structure is somehow impaired. Ozone, by changing such conditions, and restoring the vital energy at the same time, proves its own superiority to chlorine and other compounds, as the destroyer of sepsis, and the great corrigent of zymosis.

In innumerable cases where opium, morphia, quinia, iodine, bromides, etc., have been ineffectual to control or mitigate a complaint, ozone water under the concentrated form has accomplished the desired result, and rendered those drugs unnecessary, delivering

the patient from the risk of those fearful re-actions known as quininism, morphism, chloralism, bromidism, mercurialization, etc.

Again : in what physicians term " the expectant treatment," the simple ozone water is particularly efficacious. In any perceptible impairment or weakening of the nervous and muscular systems, its persistent use can be relied upon to restore health. Women anticipating the change of life will find it a proper remedy in their case. It exercises a restorative influence in convalescence after long and exhaustive sickness, eradicating whatever susceptibility may exist for any relapse.

These results are all to be attributed, we cannot repeat too often, to the antizymotic quality of ozone. It purifies the blood, arrests and prevents decomposition in the fluids and tissues of the body, assures the purity of the blood-forming material, and invigorates the nervous and muscular structures. The various and complicated functions of the system are thus performed with uninterrupted regularity, and the individual sustained in health. It is a corrective, aperient, alterative, and purifier of the circulation. Its beneficial effects are speedily derived in all forms of intestinal disease, malarial or choleraic ; also in rheumatism, and, in short, in all disorders owing their existence to a depressed condition of the nervous system, or a morbid state of the blood. It is equally efficacious as a lotion for open wounds, ulcers, eruptions of the skin, diseases of the eye and ear, blood-poisoning, and inflammations generally, in fact, for all ailments characterized by morbid glandular secretions, or discharges from membranes or tissues. In cutaneous eruptions, whether contagious or non-contagious, its judicious and persistent use, under the direction of the physician and according to directions, can hardly fail to ameliorate, and eventually to eradicate, the disorder, however it may be seated.

Distinguished physicians have given the same testimony. Professor Mohl of Heidelberg, in a recent lecture, declared the ozone therapeutics to be the greatest and most important characteristic in future medication. Professor Kuhne and Dr. Scholz also declare their conviction, derived from experience, that ozone must and will be a permanent factor in the medical practice of the future.

